OXYGEN PROBE

Cross Reference to Related Application

This application is a continuation of international PCT application No. PCT/ES00/00309 filed on August 10, 1999.

D E S C R I P T I O N

OBJECT OF THE INVENTION

The invention relates to a probe which is sensitive to the amount of oxygen present in a fluid, with operation conditions requiring said probe to withstand high temperatures and, particularly, high pressures.

The object of the invention is to provide an oxygen probe which operates using the oxygen concentration battery principle, in which probe can be established a potential difference measurable on either side of an ionic conducting tube (sensor element) immersed in the fluid, constructed such that it can be used in conditions of extreme temperature and pressure, as those corresponding to water-steam circuits in nuclear and thermal plants.

BACKGROUND OF THE INVENTION

A sensor is a measurement device placed in the

vicinity of an enclosure in which flow or are contained gases, liquids or whichever element to be measured, and which responds in a known and predictable manner to fluctuations in the measured variable. Generally speaking, a sensor can be divided into two parts:

1) Probe

2) Power and/or signal conversion-adaptation electronics.

The probe, which is the element placed in the vicinity of the area to be measured, can in turn be divided into:

- The sensor element, which generates a change in a property which can be measured as a function of the variation of the measurement variable.

- Support element(s), whose function is to mechanically secure the sensor element to the area where the measurement is performed; in addition, in certain cases it may serve as an thermal or electronic insulator to ensure suitable working conditions for the probe.

The probe also requires complementary electronics which can translate the signal arriving from said probe into a comprehensible figure expressed in appropriate units.

In order to determine O_2 and CO_2 levels, or those of any other components of combustion, probes are known which are placed in the exhaust ducts of vehicles powered by combustion engines.

In this sense can be cited European Patent EP-0448817, particularly conceived for application for exhaust pipe gases, where existent pressures are low, so that the mechanical design of the probe object of this European Patent does not allow its use in ducts which simultaneously have high temperatures and high pressures.

An oxygen sensing unit is described in document US-A-5,049,255, which comprises a first and a second metallic bodies axially screwed onto each other. This sensing unit is specially designed for sensing oxygen in automotive exhausts, but would not perform efficiently in ducts under conditions of extreme temperature and pressure.

DESCRIPTION OF THE INVENTION

The probe object of this invention has a simple and effective design, and is embodied with a simple and sturdy construction, so that it can withstand extreme temperature and pressure conditions.

More specifically, the probe of the invention comprises two metallic bodies which are axially screwed onto each other, the first of which is in turn screwed onto an opening provided for such purpose in the wall of

the duct where the probe is to be employed. In order to prevent leaks of fluid from the pressurised area a gasket is placed between the enclosure wall and the rear stop of maximum penetration of the threaded neck of the aforementioned metallic body, creating a hermetic seal.

As the measurement principles is based on a potential difference the ends between which said potential difference, that is, the internal and external parts of the sensor element must be electrically insulated.

The second body screwed inside the previous one is meant to keep the sensor element in its housing, applying the pressure required to attain a hermetic seal between the first metallic body and the atmosphere. This seal must be achieved by means of a metallic deformable washer to maintain electrical continuity between the external and internal parts of the sensor element and the first metallic body.

The second body is provided with an axial orifice through which passes a metallic tube which has two purposes:

- Providing communication between the inside of the sensor element of the probe and the surrounding atmosphere.

- Continuing the electrical contact from the internal face of the sensor element to the outside of the probe in order to

measure the aforementioned potential difference.

In order to achieve the latter, said metallic tube is provided with a metal washer welded to it which makes electrical contact with the inner wall of the sensor element. This tube must be insulated in turn from the second body by means of a protective sheath which prevents short circuit of the signal.

This requires that the pressure applied by the sensor element on the first body take place through an interposed electrically insulating washer between the second body and the metal washer of the tube, so that the required electrical insulation is maintained.

DESCRIPTION OF THE DRAWINGS

These and further characteristics and advantages of the present invention will be better understood in view of the accompanying drawing of a preferred embodiment of the invention, where for purposes of illustration only a longitudinal sectional view is shown of the probe set as applied on the duct.

PREFERRED EMBODIMENT OF THE INVENTION

As may be seen in the aforementioned figure (fig. 1), probe (1) and specifically its sensor element labelled (2), is meant to measure the oxygen in a fluid which flows through a duct with a wall labelled (3),

inside which there exist high temperatures and pressures.

The sensor element of probe (2) is placed inside a body (4) which is mounted through a neck (5) onto an orifice provided for such purpose in duct wall (3), which mounting is achieved by threading (6).

The maximum penetration of body (4) is limited in its screwing on the orifice of duct wall (3) by its front area which stops against the outer surface of said wall (3), with the particular characteristic that the assembly is made hermetic by the interposition of a gasket (7).

Additionally, on its inside body (4) is provided with a seat for the rear area of the probe's sensor element (2).

The structure is complemented by a second body (8) which is screwed axially onto the inside of body (4), such that in its axial motion as it is screwed inside body (4) said second body (8) presses against the sensor element (2) of the probe in its housing.

Body (8) is provided with an axial concentric orifice for passage of a metal tube (9) which contacts the inner metallic surface of probe sensor element (2) through a metallic washer (10) soldered to said tube (9), establishing the connection required for measurement.

The seal between external part of sensor element (2) and the surrounding atmosphere is achieved by means

of a deformable metallic washer (11). The pressure exerted by second body (8) on sensor element (2) in order to secure it in its housing takes place with an electrically insulating washer (12) interposed between the second body (8) and the metallic washer (10) soldered to metal tube (9), which electrically contacts the inner part of sensor element (2).

The potential difference established is measured between metal tube (9) and first metal body (4). In order to aid the electrical connection between metallic body (4) and the signal transmission wire, an electric connector (13) may be welded to first body (4).

Lastly, metallic tube (9) is insulated from second body (8) by a protective sheath (14) which prevents short circuit of the signal.